

AD-A048 951

AEROSPACE MEDICAL RESEARCH LAB WRIGHT-PATTERSON AFB OHIO F/G 20/1  
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 114. MB-1 COM--ETC(U)  
DEC 76 N A FARINACCI

UNCLASSIFIED

AMRL-TR-75-50-VOL-114

NL

| 0F |  
ADA048 951

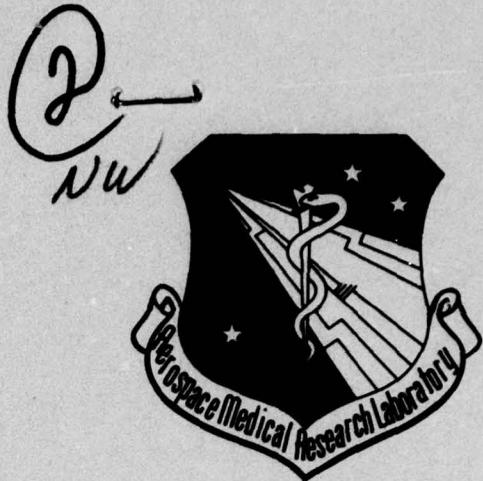


END  
DATE  
FILMED  
2-78  
DDC

AD No. 1  
DOC FILE COPY

AD A 048951

14 AMRL-TR-75-56-VOL-114  
Volume 114



6 USAF BIOENVIRONMENTAL NOISE DATA  
HANDBOOK.

Volume 114.

MB-1 Compressor, Reciprocating, Power Driven.

9 Technical rept.,

10 Nick A. Farinacci

11 DEC 76

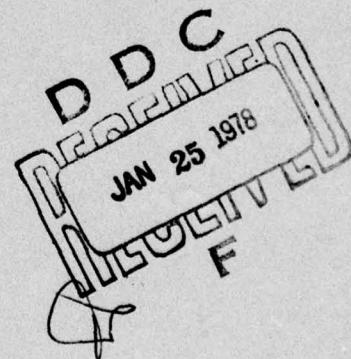
12 18 P.

16 7231

17 4

Vol 115-A048 952

Approved for public release; distribution unlimited.



AEROSPACE MEDICAL RESEARCH LABORATORY  
AEROSPACE MEDICAL DIVISION  
AIR FORCE SYSTEMS COMMAND  
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

009 850

mt

## NOTICES

When US Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Please do not request copies of this report from Aerospace Medical Research Laboratory. Additional copies may be purchased from:

National Technical Information Service  
5285 Port Royal Road  
Springfield, Virginia 22161

Federal Government agencies and their contractors registered with Defense Documentation Center should direct requests for copies of this report to:

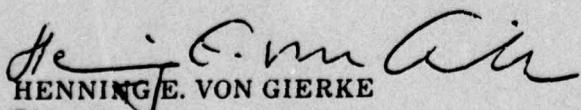
Defense Documentation Center  
Cameron Station  
Alexandria, Virginia 22314

## TECHNICAL REVIEW AND APPROVAL

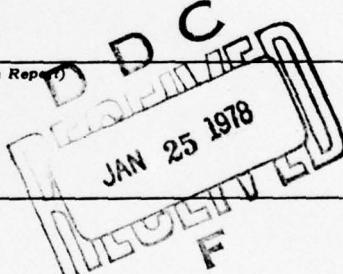
This report has been reviewed by the Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

### FOR THE COMMANDER

  
HENNING E. VON GIERKE  
Director  
Biodynamics and Bionics Division  
Aerospace Medical Research Laboratory

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER AMRL-TR-75-50, Vol. 114	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK: MB-1 Compressor, Reciprocating, Power Driven		5. TYPE OF REPORT & PERIOD COVERED Volume 114 of a series
7. AUTHOR(s) Nick A. Farinacci, Capt, USAF, BSC		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Aerospace Medical Research Laboratory Aerospace Medical Division, Air Force Systems Command, Wright-Patterson AFB OH 45433		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 7231-04-33 62202F 7231-04-36
11. CONTROLLING OFFICE NAME AND ADDRESS Same as above		12. REPORT DATE December 1976
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		13. NUMBER OF PAGES 18 15. SECURITY CLASS. (of this report) Unclassified
16. DISTRIBUTION STATEMENT (of this Report)  Approved for public release; distribution unlimited		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)  		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Noise Noise Environments Bioenvironmental Noise Ground Support Equipment MB-1 Compressor, Reciprocating, Power Driven		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  The MB-1 Compressor is an electric motor-driven air compressor designed to furnish a source of high and low pressure for aircraft servicing. This report provides measured data defining the bioacoustic environments produced by this unit operating inside a large aircraft hanger at normal rated/loaded conditions. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived <span style="float: right;">over</span>		

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Refer to Volume 1 of this handbook, USAF Bioenvironmental Noise Data Handbook, Vol. 1: Organization, Content and Application, AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the Handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc.

1

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

## PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723104, Measurement and Prediction of Noise Environments of Air Force Operations.

The author acknowledges the efforts of Mr. Robert T. England and Mr. Robert G. Powell who conducted the field measurements, and Mr. John N. Cole who established the data analysis requirements and assisted in the preparation of this report. Mr. Henry Mohlman and Mr. David Eilerman of the University of Dayton assisted in the mechanics of data processing, and Mrs. Norma Peachey typed and prepared the graphics.

SEARCHED  SERIALIZED  INDEXED  FILED

ACCESSION TO: White Section  Buff Section  NAMING  ILLUSTRATION

BY: DISTRIBUTION/AVAILABILITY CODES  A / OR SPECIAL

A

## Table of Contents

	<i>Page</i>
INTRODUCTION .....	3
NEAR-FIELD NOISE .....	4

## List of Tables

### NEAR-FIELD NOISE

1. Measurement Location and Test Condition for Operator Noise Measurements .....	4
2. Measured Sound Pressure Level 1/3 Octave Band .....	6-8
Octave Band .....	9-11
3. Measures of Human Noise Exposure .....	12-14

## List of Figures

### NEAR-FIELD NOISE

1. Measurement Locations .....	5
--------------------------------	---

## INTRODUCTION

The MB-1 Compressor is an electric motor-driven air compressor designed to furnish a source of high and low pressure for aircraft servicing.

This volume provides measured data defining the bioacoustic environments produced by this unit. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the MB-1 compressor.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and ground support equipment. The far-field, community-type, noise data in the handbook describe the noise produced during *ground operations* of aircraft, ground support equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Volume 2 provides a method and data for adjusting the handbook's far-field noise data, which are for standard meteorological conditions (15C temperature, 70% rel humidity, 0.760 meters Hg barometric pressure) to derive comparable data for other meteorological conditions. Refer to *Volumes 1 and 2* (references 1 and 2) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., inflight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of the updated index as it is generated.

Direct any questions concerning the technical data in this report and other handbook volumes to: AMRL/BBE, Wright-Patterson AFB, OH 45433; Autovon 78-53675 or 78-53664; Commercial (513) 255-3675 or (513) 255-3664.

1. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 1: Organization, Content and Application*, AMRL-TR-75-50 (1), Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1975.
2. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 2: Procedure to Evaluate Effects of Non-standard Meteorological Conditions on Far-Field Noise*, AMRL-TR-75-50 (2), AMRL, WPAFB, OH, 1975.

## NEAR-FIELD NOISE

## MEASUREMENTS

A standard MB-1 Compressor was operated inside, and approximately in the center of a large aircraft hanger (167.6 m long  $\times$  36.6 m wide  $\times$  18.3 m high) on a concrete floor at a normal rated/loaded condition. The hanger walls and ceiling were not acoustically treated. No aircraft were in the vicinity of the unit while being measured. No far-field acoustic data were acquired because of the relatively close proximity of the hanger walls.

Figure 1 identifies 36 noise measurement locations at a height of 1.5 meters above the concrete apron (nominal ear level of ground crew). The 0 degree reference direction passes through the tow bar. These locations are in the acoustic near-field of the source where the sound wave fronts generally do not spherically diverge and the source appears to be spatially distributed (i.e., not a point source). Consequently, these near-field data cannot be extrapolated to longer distances but do properly define the levels at locations close to the unit.

Near-field measurements were also made at ear level at the operator control panel. Table 1 lists the numeric/alphabetic designators used on the data pages in this report to identify the operator measurement location and test conditions. The designator 1/A means operator location 1 and test condition A. Such a descriptor is essential in many handbook volumes that involve multiple combinations of locations/conditions. It is used in this report to maintain format consistency.

## RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced by the MB-1 unit at the 37 specified, near-field locations. This table includes the overall, 1/3 octave band, and octave band levels. From these data one can calculate the variety of measures in Table 3 which are widely used to assess the effects of noise on personnel and their performance.

For data at other intermediate near-field locations (i.e., for radial distances less than 4 meters) you can interpolate between the 36 measured data points.

TABLE 1

## MEASUREMENT LOCATION AND TEST CONDITION FOR OPERATOR NOISE MEASUREMENTS

**MB-1 Compressor, Reciprocating, Power Driven**  
**Wright Patterson AFB, 8 Nov 1972**

### ***Measurement Location***

1 Operator Control Panel

### *Operation*

### A Air Tank Fill Cycle

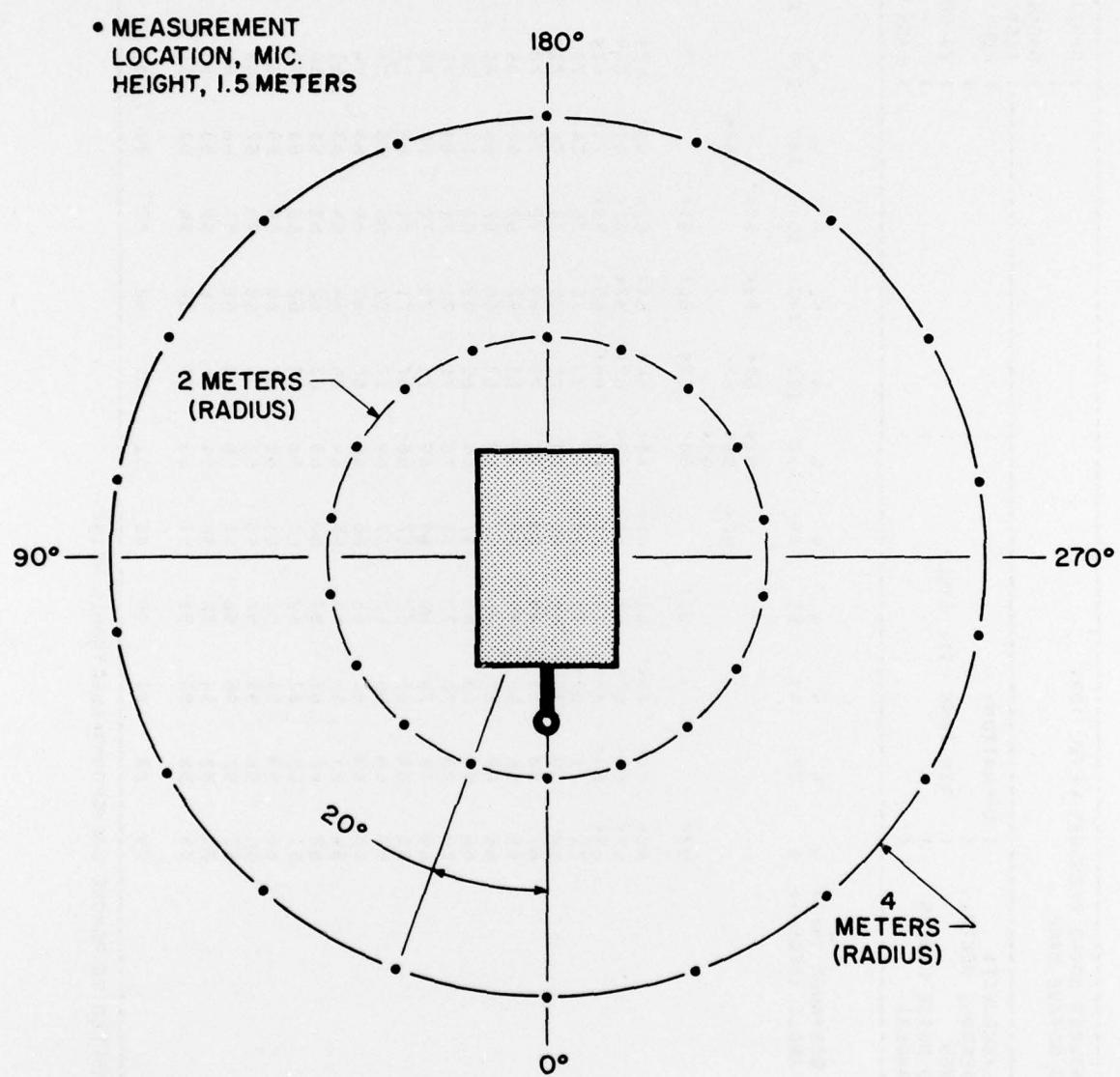


Figure 1. Measurement Locations

TABLE I MEASURED SOUND PRESSURE LEVEL (DB)  
2 1/3 OCTAVE BAND

NOISE SOURCE/SUBJECT <sup>1</sup>		OPERATION <sup>1</sup>		AIR TANK FILL CYCLE									
FREQ (HZ)	DISTANCE (M) -->	4	4	4	4	4	4	4	4	4	4	4	4
25													
31.5													
40	62<	61<	63<	61<	63<	64<	64<	64<	63<	64<	62<	62<	64<
50	60<	67<	65<	67<	68<	69<	67<	67<	67<	67<	66<	66<	67<
63	63<	69<	68<	70<	71<	70<	66<	69<	70<	71<	67<	67<	69<
80	60<	67<	65<	67<	68<	70<	71<	70<	72	76	74	72	72
100	66	66	65	66	67	67	67	67	70	74	74	71	71
125	65	67	66	67	68	68	67	67	72	76	74	72	72
160	68	68	68	68	70	70	68	70	70	75	74	71	71
200	69	69	69	70	68	70	68	70	70	70	70	70	71
250	67	68	68	69	68	71	70	69	72	76	70	72	71
315	66	66	65	66	65	66	68	68	67	67	66	66	65
400	65	67	66	67	66	67	69	67	66	67	66	65	65
500	66	68	68	68	68	68	67	68	69	68	64	66	65
630	70	70	70	72	71	70	71	71	71	71	69	70	68
800	69	70	70	69	69	71	73	72	73	74	69	70	68
1000	68	68	67	67	67	68	67	71	71	69	72	71	66
1250	67	68	66	67	67	69	67	67	66	65	65	66	66
1600	65	65	66	65	66	66	66	65	65	64	64	64	64
2000	64	64	65	65	65	64	64	64	64	63	62	63	63
2500	62	62	63	63	63	63	63	62	62	61	60	62	63
3150	61	60	62	62	63	62	63	62	60	60	59	60	62
4000	60	59	60	60	61	61	62	60	59	59	59	59	60
5000	58	58	58	57	59	58	59	58	57	57	57	57	58
6300	57	57	56	56	57	56	58	57	56	56	56	57	57
8000	57	58	56	56	56	54	56	55	53	53	55	56	56
10000	58	56	53	52	57	53	55	54	52	51	53	53	53
OVERALL	79	80	80	80	80	81	81	82	82	82	81	81	80

<sup>1</sup> LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE 2 MEASURED SOUND PRESSURE LEVEL (DB)  
1/3 OCTAVE BAND

NOISE SOURCE/SUBJECT!		OPERATION!		IDENTIFICATION!									
MB-1 COMPRESSOR, RECIP., POWER DRIVEN		AIR TANK FILL CYCLE		TEST 71-020-390					OMEGA 3-2				
NEAR FIELD NOISE LEVELS (INSIDE HANGER)				RUN 02					TEST 71-020-390				
				24 FEB 75					24 FEB 75				
				PAGE F2					PAGE F2				
FREQ (HZ)	ANGLE (DEG)	260	280	300	320	340	4	4	2	2	2	2	2
25	63	63<	62<	63<	62<	63<	64<	63<	63<	62<	61<	61<	62<
40	66<	67<	66<	66<	66<	66<	67<	69<	70<	69<	69<	69<	66<
50	69<	68<	68<	67<	68<	67<	69<	69<	68<	69<	70<	70<	69<
71	71	72	72	71	73	74	71	72	72	72	74	73	75
100	69	70	68	71	71	72	73	73	70	73	70	74	75
125	71	70	69	72	70	72	73	73	72	73	74	75	77
160	65	67	66	67	66	66	66	66	71	72	71	73	73
200	65	68	70	66	71	72	73	73	70	73	70	74	75
250	65	67	66	67	66	67	66	67	72	73	74	75	77
315	65	65	66	65	66	65	66	65	72	71	73	74	73
400	65	68	70	66	69	71	72	72	72	73	73	74	73
500	65	69	74	73	71	70	72	71	70	69	69	70	69
630	69	72	74	72	74	71	74	71	72	75	75	72	72
800	66	67	68	70	68	71	72	73	73	74	75	73	74
1000	67	67	67	67	67	68	70	70	70	70	71	72	74
1250	65	67	66	67	67	66	68	68	70	70	71	71	69
1600	64	64	65	65	65	65	68	68	69	70	70	70	68
2000	61	63	64	64	63	63	62	65	66	65	66	66	67
2500	61	62	63	62	63	63	62	64	64	65	65	65	65
3150	60	62	62	63	61	63	61	63	64	64	65	65	64
4000	58	59	60	59	59	59	62	61	62	62	62	61	62
5000	57	59	59	59	59	58	62	61	61	61	61	61	61
6300	55	57	57	57	57	57	58	60	61	59	59	59	58
8000	53	56	57	57	57	57	58	59	59	58	57	58	57
10000	53	56	57	57	57	57	58	59	59	58	57	58	57
OVERALL	80	81	81	81	80	83	83	83	83	84	84	84	85

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)

2

1/3 OCTAVE BAND

NOISE SOURCE/SUBJECT			OPERATION			IDENTIFICATION		
MB-1 COMPRESSOR, RECIP., POWER DRIVEN			AIR TANK FILL CYCLE			OMEGA 3-2 TEST 71-020-390		
NEAR FIELD NOISE LEVELS (INSIDE HANGER)			RUN 03			24 FEB 75		
			PAGE F3					
FREQ (HZ)	DISTANCE (M)-->	ANGLE (DEG)-->	160	180	200	220	240	260
			2	2	2	2	2	2
			31.5	31.5	31.5	31.5	31.5	31.5
			25	25	25	25	25	25
			40	40	40	40	40	40
			50	50	50	50	50	50
			63	63	63	63	63	63
			80	80	80	80	80	80
			100	100	100	100	100	100
			125	125	125	125	125	125
			160	160	160	160	160	160
			200	200	200	200	200	200
			250	250	250	250	250	250
			315	315	315	315	315	315
			400	400	400	400	400	400
			500	500	500	500	500	500
			630	630	630	630	630	630
			800	800	800	800	800	800
			1000	1000	1000	1000	1000	1000
			1250	1250	1250	1250	1250	1250
			1600	1600	1600	1600	1600	1600
			2000	2000	2000	2000	2000	2000
			2500	2500	2500	2500	2500	2500
			3150	3150	3150	3150	3150	3150
			4000	4000	4000	4000	4000	4000
			5000	5000	5000	5000	5000	5000
			6300	6300	6300	6300	6300	6300
			8000	8000	8000	8000	8000	8000
			10000	10000	10000	10000	10000	10000
OVERALL			85	86	86	83	82	82
						82	82	81
								84

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)  
**2** OCTAVE BAND

NOISE SOURCE/SUBJECT:		OPERATION:		IDENTIFICATION:	
MB-1 COMPRESSOR, RECIP.,	POWER DRIVEN	AIR TANK FILL CYCLE		OMEGA 3.2	
NEAR FIELD NOISE LEVELS				TEST 71-020-390	
(INSIDE HANGER)				RUN 01	
				24 FEB 75	
				PAGE J1	
FREQ (HZ)	DISTANCE (M) -->	4	4	4	4
	ANGLE (DEG) -->	0	20	40	60
31.5	64	74	73	76	69
63	74	72	72	75	65
125	74	73	73	74	66
250	72	73	73	74	77
500	72	73	74	74	76
1000	73	73	72	73	75
2000	68	69	69	70	69
4000	64	65	65	66	64
8000	62	62	60	61	61
OVERALL	79	80	80	80	81
					82
					82
					81
					80

TABLE 1: MEASURED SOUND PRESSURE LEVEL (dB)		IDENTIFICATION:									
2 OCTAVE BAND		TEST 71-020-390									
NOISE SOURCE/SUBJECT:		RUN 02									
MB-1 COMPRESSOR, RECIP.,		24 FEB 75									
POWER DRIVEN		PAGE J2									
NEAR FIELD NOISE LEVELS											
(INSIDE HANGER)											
FREQ (HZ)	ANGLE (DEG) -->	4	4	4	4	4	4	2	2	2	2
260	260	300	320	340	0	20	40	60	80	100	120
31.5											
63	74	73	74	74	76	76	75	75	76	76	76
125	73	74	73	75	74	76	77	76	76	78	78
250	72	75	75	73	73	75	76	76	76	78	80
500	72	74	74	76	74	77	76	77	77	77	76
1000	68	70	70	69	73	72	72	73	73	76	77
2000	64	66	67	67	65	68	68	68	69	69	68
4000	60	62	62	63	63	65	65	64	64	64	64
8000											
OVERALL	79	81	81	81	80	83	83	83	84	84	85

TABLE 2  
MEASURED SOUND PRESSURE LEVEL (DB)  
OCTAVE BAND

FREQ (HZ)	ANGLE (DEG)-->	OPERATION:						2 OPERATOR LOCATION 1/A			
		NEAR FIELD NOISE LEVELS (INSIDE HANGER)	AIR TANK FILL CYCLE	200	220	240	260	280	300	320	340
31.5		69	67	67	67	67	67	67	67	67	72
63		81	75	75	75	75	75	75	75	75	68
125	79	82	81	81	76	74	74	74	74	74	75
250	80	80	81	77	75	76	74	75	73	73	80
500	77	75	77	75	77	78	77	76	75	75	78
1000	78	78	77	78	77	77	77	76	77	77	76
2000	71	71	70	71	72	72	73	73	72	72	71
4000	68	67	67	67	69	69	69	69	69	67	66
8000	63	62	63	62	64	64	65	65	65	64	61
OVERALL	85	85	86	83	82	82	82	82	82	81	84



TABLE: MEASURES OF HUMAN NOISE EXPOSURE

3

NOISE SOURCE/SUBJECT		OPERATION		IDENTIFICATION	
MB-1 COMPRESSOR, RECIP.,		TEST 71-020-390		OMEGA 3-2	
POWER DRIVEN		RUN 02		AIR TANK FILL CYCLE	
NEAR FIELD NOISE LEVELS		24 FEB 75		(INSIDE HANGER)	
		PAGE H2			
DISTANCE (IN) -->	ANGLE (DEG) -->	4	4	2	2
260	280	300	320	340	360
HAZARD/PROTECTION	C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DBC) AT EAR	A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DBA) AT EAR	MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)		
NO PROTECTION					
OASLC	79	81	81	83	84
OASLA	76	78	78	80	81
T	960	960	960	960	960
MINIMUM QPL EAR MUFFS	56	57	57	59	58
OASLA*	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS	51	52	52	54	53
OASLA*	960	960	960	960	960
V-51R EAR PLUGS	52	54	55	56	56
OASLA*	960	960	960	960	960
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS	38	40	41	42	42
OASLA*	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT	49	50	52	53	53
OASLA*	960	960	960	960	960
T					
COMMUNICATION PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)	71	73	73	72	75
PSIL					
ANNOYANCE					
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)					
TONE CORRECTION (C IN DB)					
PNLT	89	91	91	92	93
C	1	1	1	0	1
			0	1	0
				1	1
				0	1
					1

\* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE

3

IDENTIFICATION																	
NOISE SOURCE/SUBJECT		OPERATION		TEST 71-020-390		TEST 71-020-390		TEST 71-020-390									
MB-1 COMPRESSOR, RECIP., POWER DRIVEN		AIR TANK FILL CYCLE		RUN 03		24 FEB 75		RUN 03									
NEAR FIELD NOISE LEVELS (INSIDE HANGER)		TEST 71-020-390		PAGE H3		PAGE H3		PAGE H3									
HAZARD/PROTECTION																	
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DBC) AT EAR																	
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DBA) AT EAR																	
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)																	
NO PROTECTION																	
OASLC	85	85	86	83	82	82	82	81	84								
OASLA	81	81	81	80	80	80	80	79	80								
T	807	807	807	960	960	960	960	960	960								
MINIMUM QPL EAR MUFFS																	
OASLC	62	63	63	58	58	58	58	57	56								
OASLA*	960	960	960	960	960	960	960	960	960								
T	AMERICAN OPTICAL 1700 EAR MUFFS	57	58	53	53	52	52	51	51								
OASLA*	960	960	960	960	960	960	960	960	960								
V-51R EAR PLUGS																	
OASLC	58	57	58	56	56	55	55	55	54								
OASLA*	960	960	960	960	960	960	960	960	960								
T	AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS	43	43	42	42	41	41	42	42								
OASLC	960	960	960	960	960	960	960	960	960								
T	H-133 GROUND COMMUNICATION UNIT	54	54	53	53	52	52	53	52								
OASLA*	960	960	960	960	960	960	960	960	960								
COMMUNICATION PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)																	
PSIL	75	75	75	75	75	74	75	75	75								
ANNOYANCE																	
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)																	
TONE CORRECTION (C IN DB)																	
PNLT	93	94	93	93	94	92	92	93	92								
C	1	1	0	1	1	0	0	0	0								

\* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.